The science for this program is based out of Muskegon at the Lake Michigan Field Station. The direct access to the lake provides for sampling flexibility to sample during events (e.g., spring flooding, upwelling) and to sample during short weather windows for the ships during certain times of the year.

This work aligns with the following NOAA goals:

Science: Weather-Ready Nation
Improve freshwater resource management
Science: Healthy Oceans
Improved understanding of ecosystems to inform resource management decisions
Sustainable fisheries and safe seafood for healthy populations and vibrant communities
Science: Resilient Coastal Communities and Economies
Comprehensive ocean and coastal planning and management
Education: Science-Informed Society
Youth and adults from all backgrounds improve their understanding of NOAA-related sciences by participating in education and outreach opportunities
Formal and informal educators integrate NOAA-related sciences into their curricula, practices, and programs
Formal and informal education organizations integrate NOAA-related science content and collaborate with NOAA scientists on the development of exhibits, media, materials, and programs that support NOAA's mission

Program Goal

Document *and* understand long-term food web changes in response to various stressors

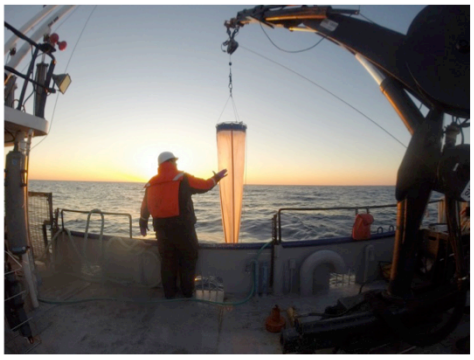
Document

Characterize critical state variables (observations)

Understand

Couple process research with the observations

Inputs to forecasting and ecological models

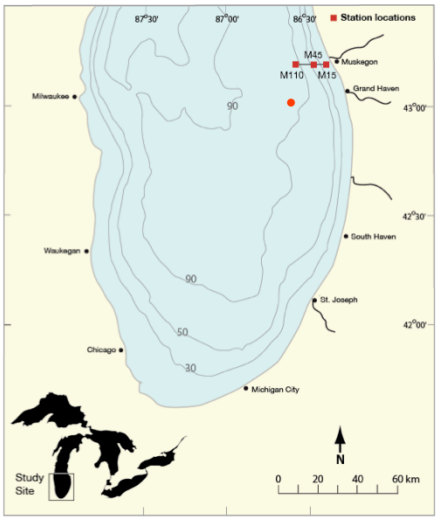


Long-term research program physically located on Lake Michigan

Addresses concepts and issues that reach beyond Lake Michigan

But given the importance and size of Lake Michigan, one could argue for the importance of studying Lake Michigan for its own sake.

EcoDyn | Core LTR Seasonal Nutrient, Plankton, & Fisheries Research Monitoring



Research plan

- Collect data on core lower food-web variables
- Collect samples March-December + overwinter moorings
- Data going back to 1983
- Sample along a nearshore to offshore gradient
- Analyze critical variables within 1-year
- Publish results in timely fashion

2010-2015: 22 publications from this project

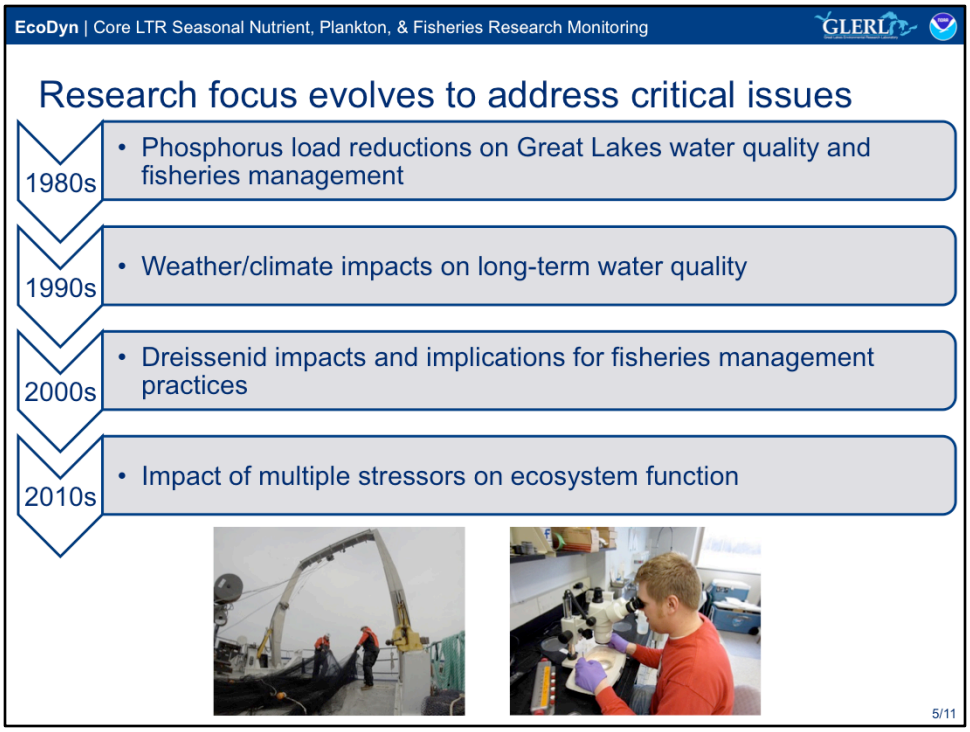
4/11

Activities: temperature, nutrients, chlorophyll, zooplankton, Mysis, mussels, fish diets, fish condition, overwinter thermistors and fluorometers

Quick turnaround of data is critical for ongoing evaluation of ecosystem changes and for adaptive sampling responses as needed; also provides partners with up to date information

2010-2015: 22 publications from this project

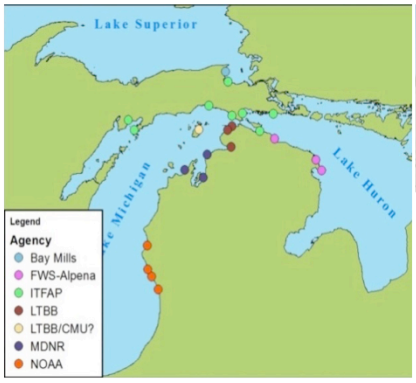
Our research approach of high intensity sampling throughout the year along a nearshore to offshore gradient has been integrated into other agencies sampling for lower food web variables

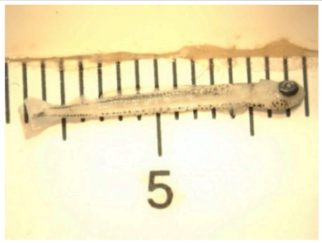


The robust data set positions us to answer yet to be identified i.e., research questions of the future, new stressors, new issues, new invaders

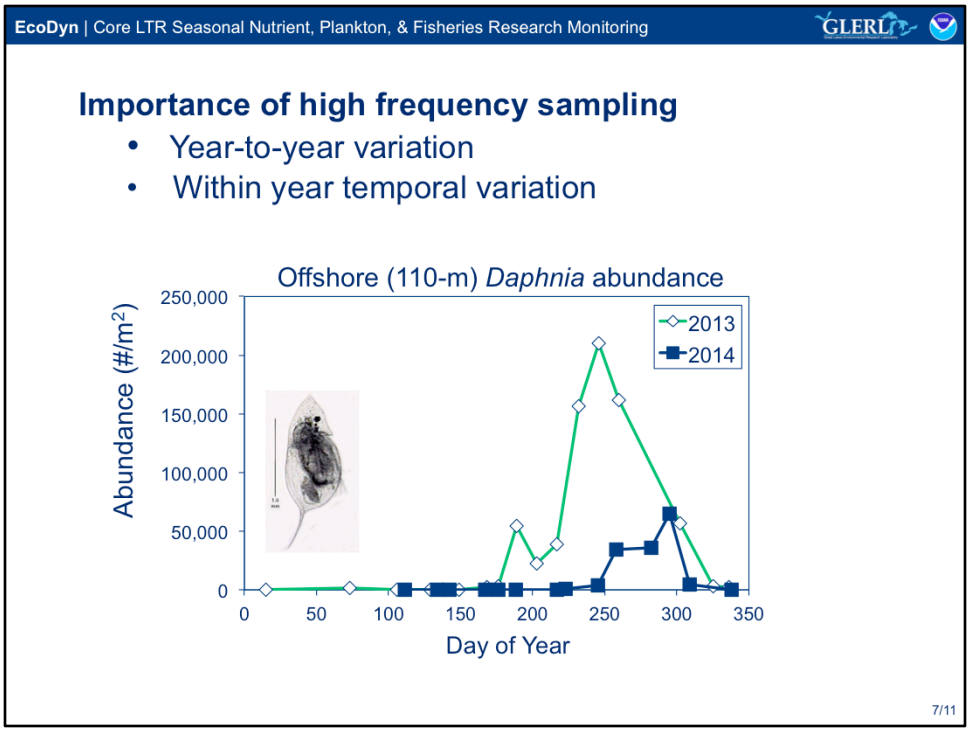
Adaptive strategy for research

Increased emphasis on the nearshore region



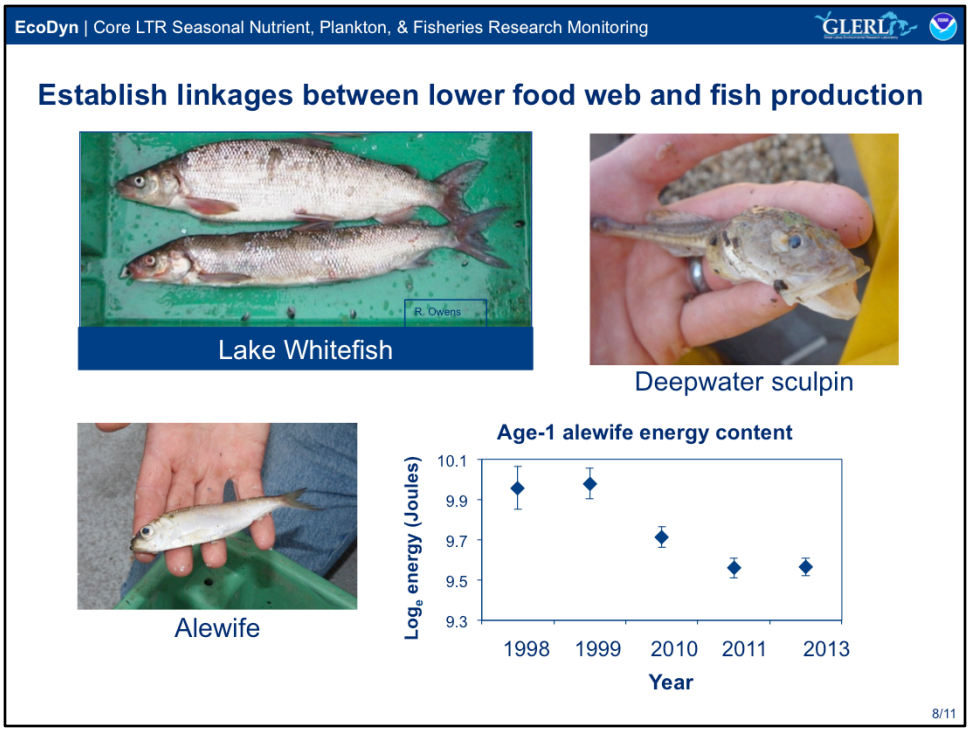


6/11



Daphnia is a large zooplankton species that is important for planktivorous fish production in the Great Lakes

Long term observations help put shorter term process studies into an 'environmental context'



Recent changes in lower food web following the dreissenid invasion have been linked to changes in fish growth and condition.
Lake whitefish-the primary commercial species in the Great Lakes. Lower condition affects growth to harvestable size and marketability of fish in some cases.
Deepwater sculpin-a glacial relict that is considered an indicator species.
Alewife-an invasive species that supports the stocked salmonine fishery; model results indicate that changes in energy content of alewife have affected salmon consumption demands.

This work is done closely with research partners at the DNR and USGS GLSC, so that each agencies strengths are combined to fill critical information gaps

Customers and collaborators

1) Informed resource managers and policy makers

- Great Lakes Fishery Commission
  - Lake Michigan Committee, Lake Michigan Technical Committee, Lower Food Web Task Group
- State Department of Natural Resources
- Tribal partners
  - Chippewa Ottawa Resource Authority
- International Joint Commission

2) Informed public

- Sea Grant fishery workshops
- Sport fishing clubs
- Commercial fishermen
- Educators

3) Information to research partners

- GLERL
- U.S. Geological Survey Great Lakes Science Center
- University of Michigan, Michigan State University, Purdue University, Grand Valley State University, Central Michigan University

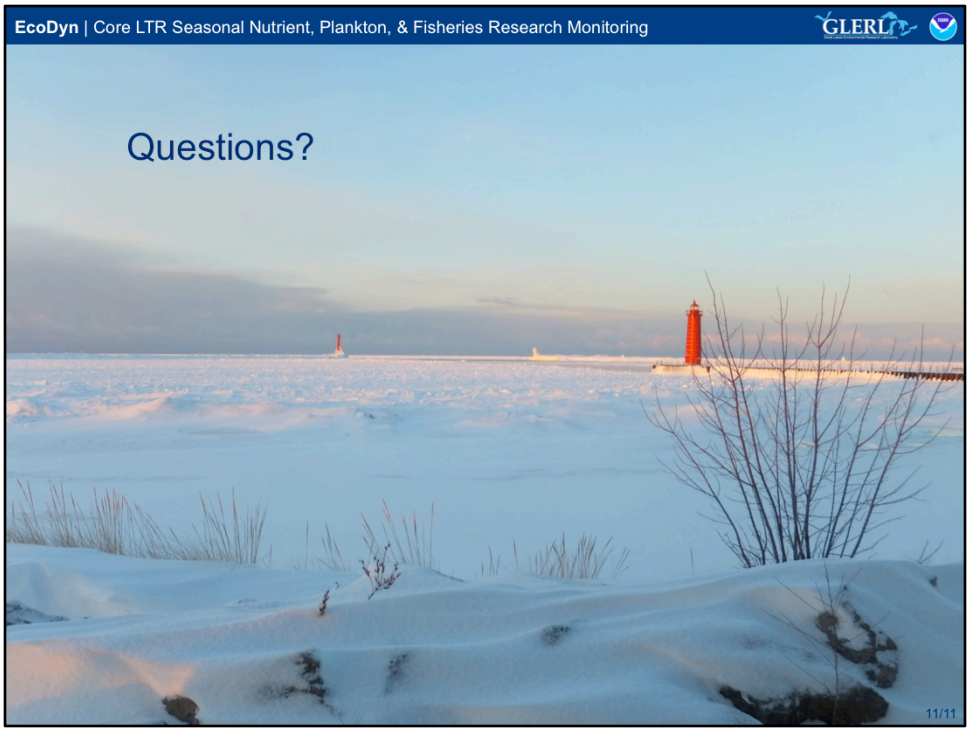
9/11

Data is readily available to share with research partners and others

Long-term vision

- Adapt to new issues and management needs
- Incorporate new technology
- Data management
- Incorporate more physical observations
- Facility improvement-LMFS
  maintain and enhance lab capabilities

10/11


EcoDyn | Core LTR Seasonal Nutrient, Plankton, & Fisheries Research Monitoring
GLERL
Questions?
11/11